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I. Deformation Studies of Metals at Elevated Temperatures

II. Aging Studies inthe 80 Nickel - 20 Chromium System Hardened Titanium and Aluminum

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I. Deformation Studies of Metals at Elevated Temperatures

In this past quarter (May through August), the work has been mainly of two phases:

1. Formulation of a working theory of intercrystalline fracture at elevated temperatures

2. Continuation in the building and testing of the new optical furnace.

The theory of intercrystalline fracture is a general one, and it is hoped will help to explain the fracture of metals and alloys. This theory is based mainly on the deformation characteristics of grains and grain boundaries which were observed in the studies on aluminum and follows directly from the conclusions already published[1,2]. This theory considers the effect of the lack of cooperative deformation of grains and grain boundaries on the initiation and propagation of intercrystalline cracks (which ultimately results in intercrystalline fracture). The results from the tests on 80 nickel - 20chromium alloy tend to agree with this theory. Before this theory is published, however, it is essential to ascertain whether the observed characteristics of fracture originated from the impurities at the grain boundaries formed by contamination during melting. For this purpose, the International Nickel Company was approached with a request for bars of deoxidized 80 nickel - 20 chromium alloy. These bars have now arrived and the specimens from these bars are being prepared.

A new optical creep furnace has been assembled and instead of dead weight loading, a lever loading system has been adopted. Since it was found that oxidation severely affected the surfaces of the specimens it was necessary to rebuild the argon purification system.

Considerable time has also been spent in detecting and preventing the leakages in the furnace and purification train.

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1. H. C. Chang and N. J. Grant: Observation of Creep of the Grain Boundary in High Purity Aluminum. Trans. AIME (1952) 194, p. 619; Journal of Metals (June 1952).
2. H. C. Chang and N. J. Grant: Grain Boundary Sliding and Migration and Intercrystalline Failure Under Creep Conditions. Trans. AIME (1953) 197, p. 305, Journal of Metals (February 1953).

II. Aging Studies in the 80 Nickel - 20 Chromium System Hardened by Titanium and Aluminum

This phase of the work is now complete and copies of a technical report are being submitted and also mailed to the distribution list.